

No. 892,522.

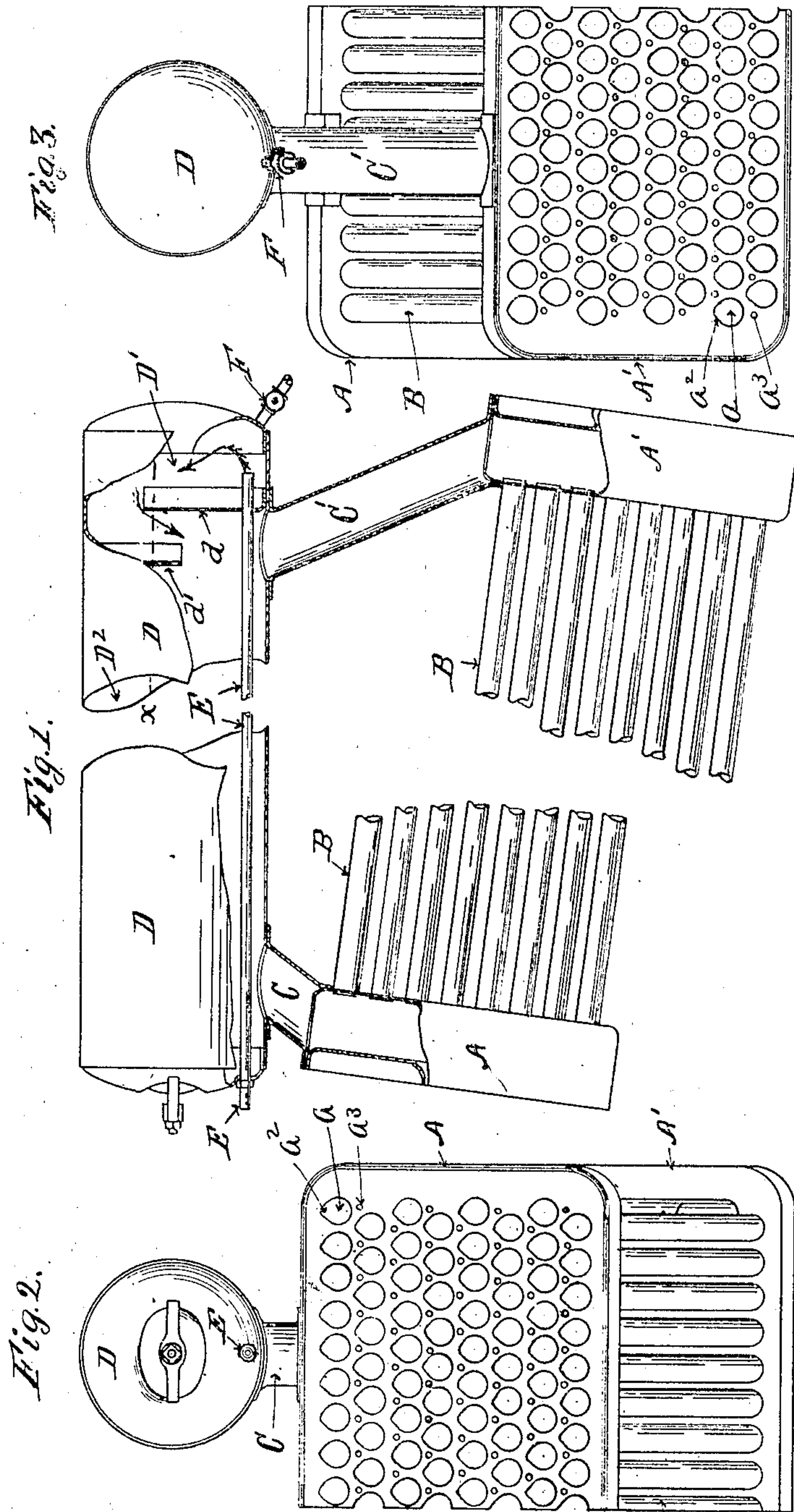
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C. S. HOOPER.

WATER TUBE BOILER.

APPLICATION FILED JAN. 29, 1908.

2 SHEETS—SHEET 1.



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UNITED STATES PATENT OFFICE.

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WATER-TUBE BOILER.

No. 892,522.

Specification of Letters Patent.

Patented July 7, 1908.

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To all whom it may concern:

Be it known that I, CHARLES S. HOOPER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Water-Tube Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention relates to that class of steam boilers in which water within tubes is exposed to heat which produces a circulation of water through the tubes and the generation of steam which separates from the water as it reaches a suitable receptacle or receptacles above it. There is a great variety of this type of boilers but a feature common to many of them is a lower receptacle for water consisting substantially of tubes connected at their ends with headers by being usually expanded into holes in one side thereof, which headers in turn are connected in various ways with an upper cylindrical receptacle which is partially filled with water so as to permit the separation of the steam above the surface of the water, which water finally travels back to the header at the rear end of the boiler and enters the tubes again. Provision is also made in the headers, in most cases, for cleaning the tubes, and for replacing worn or defective ones. These holes must be closed so as to resist the steam pressure, which has been done by using in most cases ordinary oval hand-hole plates, in others by screw plugs, and in some cases by bolting plates over the holes. The hand-hole plates is the most desirable form of closure, but it is somewhat difficult to properly stay-bolt the header if the ordinary oval hand-hole plate is used.

One of the objects of my invention is to make the openings in the headers round for about three fourths of their circumference and the remaining one fourth thereof so that the opening extends outward from the circular form so that a hand-hole plate can be passed therethrough. This shaped opening leaves ample room for the placing of stay-

bolts, so that comparatively thin plate can be used in the construction of the headers. 55

Another of the features of my invention is the placing of diaphragms in the rear end of the upper cylindrical receptacle, one near its rear end and behind the connection thereof with the rear header, and extending from the button thereof upward to a point approximately at or a little above the normal water line therein, and the other a short distance in front of the first mentioned diaphragm and extending from the top of the cylindrical receptacle downward somewhat below the water line therein, and delivering the feed-water to the boiler behind the diaphragm nearest the rear end of the boiler whence it passes over the top of this diaphragm and downward behind the second diaphragm so that it is delivered into the water space in the upper receptacle directly over the connection thereof with the rear header, and without in anywise coming into contact with and saturating the steam in the steam space in front of the diaphragms, as is ordinarily the case with boilers of this type, in which the feed water on coming from a heater is fed into the boiler at a much lower temperature than that of the steam therein, and therefore tends to saturate the steam therein to a greater or less extent, which I avoid in my construction by feeding the water into the boiler behind the rear diaphragm above referred to, where it deposits such sediment as will be separated from the feed-water, at the temperature it is fed into the boiler, and then will rise above and flow over the upper end of the rear diaphragm and thence pass downward between the front and rear diaphragms toward the connection with the rear header, and thereby be prevented from contacting with and saturating the steam in the steam space in front of the first or front diaphragm, and I preferably deliver the water into the upper receptacle at this point by running the feed-pipe water through the lower part of the upper receptacle from the front end thereof to a point behind the diaphragms so that in its passage through the lower part of the boiler it becomes heated approximately to the temperature of the water surrounding the feed-water pipe before it is discharged therefrom. I can, however, if desired, extend the feed-water pipe along under the 105

upper receptacle and thence into the rear end thereof, and when so located it is subjected to the direct heat of the fire and thereby is heated to the desired temperature before it enters the boiler.

These and other features of my invention are hereinafter fully set forth and explained, and illustrated in the accompanying drawings, in which:

10 Figure 1 is a view of my improved water-tube boiler partially in elevation and partially in section. Fig. 2 is a front end view in elevation of a section of the same. Fig. 3 is a rear view in elevation of the same. Fig. 15 4 is a detail showing a group of the hand-holes and the closure thereof. Fig. 5 is a sectional detail, showing a section of one of the headers and the water-tubes. Fig. 6 shows a detail of the hand-hole closures. Fig. 7 is 20 a view of my improved water-tube boiler partially in elevation and partially in section showing a modified arrangement of the feed-water pipes thereof. Fig. 8 is a front view in elevation of a section of the same.

25 In these drawings illustrating my invention, A is the front header, A' the rear header, B the water-tubes secured therein, D the upper receptacle or steam-drum, C the connection between the top of the front header 30 A and the front end of the steam-drum D, and C' the connection between the top of the rear header A' and the rear portion of the steam-drum D, all of which parts of my improved water-tube boiler are, except as here- 35 inafter set forth, of the usual construction.

In the rear end of the steam-drum D just at the rear of the connection C' therewith, I secure a diaphragm d extending upward from the bottom of the drum D to a point at or 40 somewhat above the water-line x therein. A short distance in front of the diaphragm d , I secure another diaphragm d' which extends downward from the top of the drum D to a point below the water line x therein, so that 45 a chamber D' is formed at the rear end of the drum D to receive the feed-water delivered into the boiler without injecting it into the steam-chamber D² proper, which extends from the diaphragm d' to the front end of the 50 drum D. The feed-water pipe E, I preferably extend through the front end of the drum D near the bottom thereof, and thence along near the bottom of the drum D to and through the diaphragm d , where it discharges 55 into the chamber D' as illustrated in Fig. 1. In lieu however of extending the feed-water pipe E through the lower part of the drum D, I can place a feed-water pipe E' along the under side of the drum D from the front to the 60 rear thereof, where it will be exposed to the heat of the fire thereunder, and at the rear end of the drum D connect it therewith behind the rear diaphragm d , by means of connections e , substantially as illustrated in 65 Fig. 7. The feed-water in either case is thus

heated to comparatively high temperature before it is delivered into the boiler; the feed-water then passes up behind and over the upper edge of the diaphragm d forming part of the front wall of the chamber D' and down 70 behind the diaphragm d' forming the remainder of the front wall of said chamber, toward the connection C' between the rear end of the drum D and the top of the rear header A', into which connection C' it speedily 75 passes, and is circulated through the tubes B forming the lower portion of the boiler, and incidentally the feed-water on being delivered into the chamber D' deposits therein the sediment and other impurities contained therein 80 which settle to the bottom of this chamber, whence they can be blown off through the blow-off cock F.

The front and rear headers A and A' of the boiler have the tubes B expanded into holes 85 in their inner faces in the usual manner, and in their outer faces opposite each of the tubes B there is a cleaning hole a which is round for about three fourths of its circumference and the remaining one fourth thereof is extended 90 outward terminating in a rounded point a^2 , as is clearly shown in Figs. 2 and 3, and in the enlarged section Fig. 4, whereby a cleaning hole plate G of like shape can be inserted 95 therethrough and secured in place by means of a yoke H, which I preferably make tripod shaped, and with a slot h therein to receive the clamping-bolt I. The cleaning-hole 100 plate G I preferably make with a central slot g , provided with overhanging edges g' with which the head i of the clamping-bolt I engages, all of these parts being clearly shown in Fig. 6, and they are also shown together in place in Fig. 5. The main objects of making 105 the cleaning-holes of the peculiar shape hereinbefore described is that there is ample room for stay-bolts a^3 which can thus be located in the headers A A' in such a manner that they will firmly stay the sides of the headers, and at the same time not in any manner interfere 110 with the cleaning holes a , and the construction of the yoke H and cleaning-hole plate G are such that they can readily and quickly be secured in place by means of the bolt I without passing it through holes therein. 115

Having thus shown and described my invention so as to enable others to utilize the same, what I claim as new and desire to secure by Letters-Patent of the United States is:

1. In a steam boiler, a steam-drum, a diaphragm near the rear end thereof extending from the bottom of the steam-drum upward, another diaphragm in front of the first named diaphragm extending from the top of the steam-drum downward, and a feed-water inlet discharging the feed-water into the steam-drum between the end of the steam-drum and the diaphragm nearest thereto, substantially as set forth. 120 125 130

2. In a water-tube boiler, an upper steam-drum, a diaphragm therein near its rear end extending from the bottom of the steam-drum upward to a point at or above the normal water-line thereof, a second diaphragm therein in front of the first named diaphragm extending from the top of the steam-drum downward below the normal water-line thereof, a down-take pipe in the bottom of the steam-drum between said diaphragms, and a feed-water pipe entering said steam drum behind the rear-most diaphragm therein, substantially as set forth.

3. In a water-tube boiler, an upper steam-drum, a diaphragm near its rear end extending from the bottom of said steam-drum to a point at or above the normal water-line thereof, a second diaphragm in front of the first named diaphragm extending downward from the top of the steam-drum to a point at or below the normal water-line thereof, a down-take pipe in the bottom of the steam-drum between said diaphragms, a feed-water pipe entering the steam-drum behind the rear diaphragm, and a blow-off pipe in

the rear end of the steam-drum behind the rearmost diaphragm, substantially as set forth.

4. In a water-tube boiler, an upper steam-drum, a diaphragm therein near its rear end extending from the bottom of the steam-drum upward to or above the normal water-line thereof, a second diaphragm in said steam-drum in front of the first named diaphragm extending from the top of the steam-drum downward to or below the normal water-line thereof, and a feed-water pipe extending from the front to the rear end of the steam-drum, in such a manner as to be subjected to the heat applied to the steam-drum, and into the chamber between the rearmost diaphragm and the rear end of the steam-drum, substantially as set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES S. HOOPER.

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